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ASW...NOT JUST A NAVY SPORT. THE NEED FOR JOINT ASW.

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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Abstract

ASW is an asset-intensive “team sport” that requires the efforts of the Navy’s air, surface and subsurface communities. Today’s ASW threat is different and more challenging than during the Cold War. A confluence of post-Cold War events vastly changed the nature of ASW and the way it needs to be approached in the future. The fall of the Soviet Union effectively removed the only open ocean ASW threat to U.S. Forces and subsequent regional conflicts focused the Navy’s efforts and resources on the littorals. Navy post-Cold War focus on expeditionary warfare, presence and power projection ashore (strike) diverted ASW resources and fueled a “mission creep” that eroded both ASW capabilities and proficiency of traditional ASW forces. The US Navy in effect took an ASW holiday in the decade immediately following the end of the Cold War and has only recently refocused on ASW. Today’s ASW asset-poor environment, restricted access ashore and the growing anti-access threat of modern diesel-electric submarines operating in harsh littoral waters requires a joint solution to the problem.

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Introduction

“ASW is not a mission we can outsource to ... (the) joint community....it is distinctly naval.”

Admiral Thomas Fargo, COMPACFLT¹

Success in any military operation depends on battlespace (air, land, sea or space) dominance. The fact that more than 95 percent of all equipment and supplies needed to sustain the U.S. military is carried by sea², access to large, friendly shore-based facilities has declined, and modern, extremely capable diesel-electric submarines have greatly proliferated, demand that maritime domain dominance become essential to future joint doctrine. Modern diesel-electric submarines and to a lesser extent, naval mines, are the greatest threats to freedom of action in the maritime domain.

The traditional view is that Undersea Warfare (USW) and Anti-Submarine Warfare (ASW) in particular, are “Navy problems.” The fall of the Soviet Union and the resultant absence of the United States’ only “blue water” threat shifted the U.S. Navy’s focus to the potential threats in the littoral regions of the world. This concentration on expeditionary warfare, presence, and power projection ashore (strike) resulted in the Navy largely neglecting the USW/ASW capabilities of its forces for nearly a decade. Not until the late 1990s was there any serious effort to transform neglected, Cold War centric ASW capabilities to those required to succeed in the harsh shallow water littorals to counter the littoral ASW threat.³

Owen Cote and Michael Sapolsky, Massachusetts Institute of Technology Security Studies Program leaders, noted in 1997 that “just as the Navy is the enabling force for the other services, ASW is the enabling mission for the Navy.”⁴ The ability of a single modern

diesel-electric submarine or a well placed mine field to deny or delay access to a key objective ashore or interdict a Sea Line of Communication (SLOC) requires operational planners to consider all their tools in their maritime domain dominance toolbox. The potentially dramatic strategic and operational effects that an adversary can achieve with relatively few tactical assets demand our attention.

As potential adversaries continue to acquire modern diesel-electric submarines and increase their stocks of mines, the Joint Force Commander (JFC) and his planning staff need to continue to rely on the US Navy to neutralize the anti-access threats, but this challenge is best solved by a truly joint approach. The asset-intensive nature of ASW and the dependence of other Component Commanders on maritime domain dominance make ASW ripe for a joint integrated approach. The Land Component Commander (LCC), Air Component Commander (ACC), and Special Operations Component Commander (SOCC) all have potentially key roles in this fight and are truly stakeholders in maritime domain dominance.

Background

The nature of ASW/USW has changed. During the Cold War the ASW focus and emphasis was against Soviet submarines in the deep blue open ocean. Decades of effort were spent on Tactics, Techniques, and Procedures (TTPs) as well as sensors and platforms to counter the threat. During that time U.S. Navy ASW practitioners enjoyed relatively reliable acoustic paths, non-congested waters, loud targets, and robust asset inventories.

The end of the Cold War virtually eliminated any challenge to the United States' dominance of the world's oceans, especially from Soviet submarines. Accordingly, the Navy

downsized in both equipment and personnel. Conflicts in the ensuing decade in Iraq, Afghanistan, Kosovo, Bosnia, and Somalia helped focus the Navy's attention on missions of overland power projection.⁵ The "traditional" naval experts in ASW/USW focused on new mission sets with fewer assets that further eroded ASW/USW proficiency and capabilities. These "neglects" and "mission pulls" were felt by all naval communities. Examples of the post-Cold War resource reallocation that contributed to the Navy's "ASW holiday" included a 50% reduction in P-3 Maritime Patrol Aviation assets, the complete phase out of the S-3B Viking carrier-based ASW aircraft, and the reduction in number of nuclear powered attack submarines. In fact a Joint Chiefs of Staff (JCS) study released in February 2000, noted a 55-68 attack submarine requirement by 2015 and 65-78 by 2025 to meet emerging requirements that included ASW as well as intelligence, surveillance and reconnaissance missions. With only one Virginia class submarine being built per year, the Navy will be 30 attack submarines short of the JCS requirement in 18 years.⁶

With the fall of the Soviet Union and the end of the Cold War there was no longer a credible open ocean threat and the Navy turned its attention to the "brown", shallow waters of the littorals. This was relatively new territory and the operating environment was quite different. These noisy shallow waters, with their myriad merchant vessels, are subject to near-shore oceanographic phenomena which make their modeling extremely difficult and acoustic sensors prone to false alarms. These littoral environmental factors all contribute to the difficulty in detecting, locating and tracking subsurface targets.⁷

By early 1997, however, the end of the ASW holiday was in sight for the Navy. In 1997, the Chief of Naval Operations (CNO) testified before congress that submarines and mines are among the most serious threats to the US Navy. That same year the 1997 ASW

assessment was produced and ASW funding stabilized.⁸ The continued upswing in emphasis in Navy ASW led to the creation of Task Force ASW and the Flag Officer-commanded Fleet ASW Command in San Diego. The Pacific Fleet Commander from 2002-2005, Admiral Walter Doran, commented numerous times that “ASW is my top warfighting concern in the Pacific theater.”⁹ This sentiment was echoed by his successor, Admiral Gary Roughead, and the commitment to the words was evident when the requirement was established for every Pacific Fleet Carrier Strike Group (CSG) and Expeditionary Strike Group (ESG) to complete an USW certification exercise (USWEX) as its “final exam” before commencing a forward deployment.¹⁰

The upward trend in ASW revitalization is encouraging, albeit long overdue. The same cannot be said in the realm of defensive mine counter measures (MCM). “The Navy’s defensive MCM capabilities in deep water are considered fair today, but they are still very poor in very shallow water (VSW) – not much better in fact than they were some 50 years ago.”¹¹

“We have to adapt ourselves to the new world. The new world is the proliferation of very capable, very quiet SSK diesel-electric submarines throughout the world.”

Admiral Walter Doran, COMPACFLT¹²

The decision to refocus the mission from ASW at the end of the Cold War was made with a faulty assumption; that the U.S. would enjoy unfettered access to the littoral as well as the high seas. This assumption has been dispelled by the proliferation of modern diesel-electric submarines and mines around the globe. It is predicted that conventional diesel-electric submarine sales will double by 2010, with an estimated 60 submarines being bought

by 20 countries from shipbuilding firms in the former Soviet Union, Sweden, Germany, Australia, and Italy.¹³ In the Pacific alone there are over 250 submarines, of which only 30% belong to allied nations.¹⁴ As far as mines are concerned, at least 20 countries export advanced sea mines and at least 50 maintain large sea mine inventories.¹⁵

What has once again become clear to the Navy during this ASW revival is that it is a “team sport.” In other words, it is a difficult problem that requires an interdisciplinary approach...there is no “silver bullet.” It involves multiple platforms and sensors to prosecute a subsurface target. There are volumes of examples that lead to this conclusion, but the sentiment is best reflected in former COMLANTFLT Chief of staff Vice Admiral (ret) Albert Konetzni’s remarks to the House Armed Services Committee in November 2005: “...while there are promising new technical developments, none of them will deliver a transparent littoral ocean or lead to a quantum leap in offshore capability soon.” He added, “...instead of instilling strict discipline in access missions of mine and anti-submarine warfare, we appear to ignore study after study regarding shortfalls in platforms, training [and] concepts of operations, and have replaced these truly ‘transformational’, proven methods with a desire to find a ‘holy grail’.”¹⁶

Projecting Joint Operational Independence...Sea Basing

Sea Basing as defined in CNO Admiral Vern Clark’s “Sea Power 21” is: projecting joint operational independence. Sea Basing was and is viewed as the means to exploit the largest maneuver area in the world, the sea. It is the foundation from which offensive and

defensive fires are projected, making the other 2 pillars of Sea Power 21, Sea Strike and Sea Shield, realities.¹⁷

Sea Basing is not a new concept, but an increasingly important one as access ashore in today's political environment is declining. A recent Defense Science Board report on Sea Basing noted that international political acceptance of US bases on foreign soil has "changed dramatically" since the Cold War and that substantial US bases in the Middle East have added to political "unraveling" in that region. The Pentagon's new "Sea Basing Joint Integrating Concept" report described the challenge expected during the 2015-2025 timeframe as maintaining "American global presence and security in the face of decreasing access."¹⁸

The Navy and Marine Corps commitment to Sea Basing was reaffirmed in the recent publication of the "Naval Operations Concept." A key naval mission is Sea Control (means), one listed method (ways) is Sea Basing, and the strategic goal (end) is to "secure strategic access and retain global freedom of action." The concept calls for "more widely distributed forces to provide increased forward presence...around the world where access might be difficult."¹⁹

The Sea Basing concept is generating a great deal of interest from the Army as well. For years the Army has been working on a version of offshore basing including developing Sea Basing platforms like the "Austere Access High Speed Ship (AAHSS)" and reorganizing prepositioning ships into the Army Strategic Flotilla.²⁰ The dilemma of restricted future access ashore requires an alternate basing option for US Army forces.²¹

The protection of the Sea Base is critical to its viability. The complex threat that an adversarial submarine or minefield poses to the Sea Base is a challenge that the Navy is once

again addressing through its revitalization of ASW. The US Air Force's 2005 "substantially rewritten" Counter Sea Doctrine Document seems to lend evidence to their realization of the importance of maritime dominance in today's restricted access littoral battlespace.

Foundational doctrine statements include: "Air Forces can provide rapid and large area coverage and often engage the adversary long before other forces arrive, transitioning swiftly from defensive to offensive roles to dominate the maritime environment." Collateral functions include antisurface ship and antisubmarine warfare.²²

The Cost of Getting it Wrong

The Falkland conflict provides a good example of the impact a small number of submarines can have on major operations. The effects on both the Argentine Forces as well as the British were profound. Both sides recognized the effect the mere presence of a submarine would have on the other. Argentine operational planners, convinced that the UK was in receipt of satellite intelligence, went as far as to reposition the *Santiago del Estero*, a "Guppy" submarine incapable of submerging, to a covered location in Puerto Belgrano in the hope that the British would conclude she was on patrol. In fact, only one Argentine submarine, the *Santa Fe*, was at sea.²³ The British perspective of the operational effects a single submarine could have was much the same. When the British submarine HMS *Conqueror* put to sea on the 28th of March, 1982, Prime Minister Thatcher remarked that "I was not too displeased when the following day news of the decision leaked. The submarine would take two weeks to get to the South Atlantic, but it could begin to influence events straight away."²⁴

Similarly, the reactions of the British and Argentineans to the actual actions of these few tactical assets bear a quick study. The operational effect the sinking of the Argentine Cruiser, *General Belgrano*, had on the Argentine Navy was immense. Its sinking outside the British declared exclusion zone suggested to the Argentines that the UK was conducting unrestricted submarine warfare. The result was the complete withdrawal of Argentine surface naval forces to secure coastal waters. The brunt of the Argentine Navy's fight now fell upon its air arm. Flying from extreme distances ashore significantly reduced their combat effectiveness since time on station was measured in minutes.²⁵ The effect on the British side was also impressive as huge amounts of ordnance were expended, nearly to the point of depletion on some ships, (mostly against false contacts).²⁶ This weight of effort was reflected in Commodore Woodward's belief that a "major mishap" such as a mine or torpedo in either of his two carriers would have "almost certainly proved fatal to the whole operation."²⁷ The lone Argentine submarine *San Luis* did in fact manage to conduct valid attacks on British surface units on the 8th and 11th of May but in both cases her torpedoes malfunctioned and she retired as a result. The British surface forces narrowly avoided disaster as a result of these weapons failures.²⁸

These historical examples are relevant to today's potential threat in the littorals. It is easy to imagine that an adversary possessing a key geostrategic position, such as a strait, with a few modern diesel-electric submarines or advanced sea mines can effectively delay or deny access to key maneuver space U.S. forces desire. The effect of restricting maritime freedom of action could result in the marginalization of Carrier Air in the same manner it did for the Argentines or could significantly delay an amphibious landing. Carrier Air power and Marine onward movement in OEF was used to great effect from the big decks in the North

Arabian Sea where there was no known submarine or mine threat. It is speculative but logical that a credible subsurface threat would have delayed offensive actions in OEF as the USAF struggled for host nation basing rights.

Patience is not a virtue in the American culture. After Desert Storm, OEF and OIF (D-day to the fall of Baghdad), Americans have come to expect swift military victories. Will political will erode in the face of such delays? A delay of several weeks during the early phases of an operation may not be a “war stopper” all by itself, but the complex Time Phased Force Deployment List (TPFDL) timelines and synchronization matrices that assume the rapid, synchronized closure of huge amounts of pre-positioned sealift would be thrown askew. A rapid deployment would turn into a slow one and grant the adversary the advantage of the factor of time and the ability to operate unmolested except for the forces already there, assuming they do not need an open SLOC to sustain themselves.²⁹

Capable ASW forces are obviously key to the protection of any Sea Base. Protection of a Sea Base assumes greater importance for many potential coalition partners. Foreign war game participants have said that the stakes are higher for most partners, many of which have fewer resources. They simply may not be able to afford the loss of a Sea Base.³⁰ A lack of ASW capability may make potential coalition partners hesitant to join the fight, particularly if they lack their own ASW capabilities.

Counter Arguments

Some have questioned whether or not these diesel-electric submarines are really a credible threat. Casual observance would lead one to believe that an “old diesel” doesn’t

stack up to a modern nuclear submarine, and a struggling state's manning, training and maintenance are surely inferior to modern western Navies. The problem with this line of thought is that the reality is these modern diesel-electric submarines are extremely quiet and operate in acoustically challenging waters. Besides being extremely quiet they possess increasingly capable sensors and weapons systems. Consider the PLA Navy's Kilo 636 class that has a capable anti-ship cruise missile, wake-homing torpedoes and an excellent fire control system.³¹ Remember the effect that one submarine had on the Argentine Navy.

As for mines, even unsophisticated ones are inexpensive force multipliers for a weak state bent on access denial. This was painfully relearned in Operation Desert Storm when USS *Tripoli* and USS *Princeton* fell prey to Iraqi mines.

The Sea Basing concept has also been questioned from many corners. The Senate Armed Services Committee and experts at a 2005 war game said that the concept is still ill defined and raised issues such as: sea state, weather, lead time to position, sea control and the enemy threat.³² These are valid issues that will require unique solutions. Despite these criticisms the Navy and Marine Corps reaffirmed their commitment to the concept with the September 2006 signing of the Naval Operations Concept in which Sea Basing was identified as a key method to achieve strategic objectives. Other positive vectors with regard to Sea Basing are: the Pentagon's Sea Basing Joint Integrating Concept (one of the Joint Operations Concepts family that looks beyond the FYDP); the US Army's pursuit of AAHSS; the reorganization of its pre-positioning ships into strategic flotillas; and Army Futures Center Training and Doctrine Command's conceptual "sustainment via Sea Basing" studies.³³

The Navy can do it alone. That's true, if delay or an undetermined amount of risk is accepted. For the foreseeable future, the Navy will be short the necessary assets to

effectively counter the ASW threat. The sheer asset-intensive effort to counter subsurface targets in the littorals demands to a more joint, force multiplier approach to the problem. Navy ASW asset inventory is nowhere near the level enjoyed during the Cold War. ASW TTPs and technology in particular have come a long way since the Cold War, but the nature of the problem has changed as the operating environment has shifted to the shallow, noisy littoral waters against increasingly quieter diesel-electric submarines. Consider the 2004 prosecution of a Chinese Han nuclear submarine that navigated Japanese territorial waters: a prosecution that lasted less than two days, but took the combined efforts of an entire U.S. P-3C squadron, numerous Japanese P-3Cs, a number of U.S. surface combatants, submarines and a T-AGOS surveillance ship. All those assets were needed to track an old, noisy Chinese nuclear submarine.³⁴

Recommendations

Sustain.

The Navy shows little evidence in decreasing its emphasis on ASW. It is critical that the Navy sustain its efforts in ASW revitalization. The robust ASW exercise program (particularly in the Pacific Fleet) coupled with detailed, high fidelity, honest assessment efforts by organizations like the Fleet ASW Command will continue to refine TTPs and help define future requirements. Continual assessment of our own capabilities and limitations are key to meeting the challenge. The intent of this paper is not to advocate for procurement of any particular Navy platform. Assessment of our own capabilities and limitations and careful study of potential adversaries should result in realistic assessments of acquisition strategies.

The slow build rate of new attack submarines and the ultimate buy number of the Boeing P-8A (aging P-3C replacement) are just two examples that should be continually reviewed.

Improve.

“ASW has become such an important warfare skill, especially in the Pacific, that the United States no longer has the luxury of using solely naval forces.”³⁵

The Joint Force Commander and his operational planners in particular need to take a hard, realistic view of the ASW/USW threat that adversary submarines and minefields pose. The asset-intensive and potentially lengthy prosecution to “sanitize” the JOA of these anti-access threats should produce more realistic logistical flows into the JOA. Failure to adequately plan for this delay could severely disrupt complex, orchestrated TPFDLs and synchronization efforts and grant the enemy the advantage of the factor of time. The time factor involved in “cue-to-kill” should be considered in planning as well. The mere presence of an unlocated submarine has enormous effect on our risk averse culture. Joint operational planning should include a “hold at risk” option that preserves scarce resources. The knowledge of where the adversary submarine(s) is, holding it at risk and denying his ability to influence our scheme of maneuver may be enough.

Joint operational planners need to seriously consider what the other services and component commanders bring to the ASW/USW fight. Arguably, even forces ashore can influence events at sea. Additionally, the air, land and special operations component commanders need to understand how import maritime domain dominance is to the overall success of an operation and the difficulty of ASW/USW in particular. With this

understanding they should be compelled to more readily look for complimentary capabilities within their components to assist the JFMCC in his task of sea control. Part of this effort needs to be a consistent, repeated message by Navy regarding the complexity and importance of these mission areas and a paradigm shift away from a Navy “rice bowl” position. Perhaps a beginning would be for General and Flag Officers eligible for component commander positions to attend tailored JFMCC courses of instruction prior to assuming their posts. It is not hard to imagine that such efforts could lead to unexpected support for ASW/USW procurement programs from new proponents of ASW/USW capabilities.

A true joint solution can only be achieved if other services seriously consider their ability to assist and again, understand the importance of the mission area in today’s changing battlespace. The goal here is not to make the other services the ASW/USW subject matter experts but to find complimentary capabilities to multiply ASW/USW forces. A KC-135 tanker pilot does not have to know the TTPs to track an enemy submarine but should know the importance of a periscope sighting and how and who to report this to. The U.S. Air Force’s Countersea Operations Doctrine is an encouraging example of this but there is a hint of hesitancy in the language with regard to ASW. The document clearly states that Air Force assets could perform ASW, and if needed, attack enemy submarines underway or in port. “However, extensive planning and training would be required for Air Force forces to effectively attack deployed, submerged submarines.”³⁶ The use of the word “however” indicates that the concept is not fully embraced by the USAF. This is an accurate statement for the USAF today, but minimal training would be required for USAF crews to employ surface surveillance sensors to detect exposed submarine masts and periscopes. Joint Force Intelligence Surveillance and Reconnaissance (ISR) assets could be effectively allocated to

the JFMCC for both Indications and Warning (I&W) and port surveillance. Adversary submarine and naval mine unit ports should be high on the target list for JFACC to deny the enemy the use of these assets. The USAF also continues to practice aerial offensive mining and has tremendous capacity in this regard. Keeping an enemy submarine in port is exactly where the JFC wants it. Similarly, land forces need to have an awareness of the threat these weapons pose to the joint force. For example, instead of bypassing a port facility that services submarines and mining assets, consideration should be given to securing or destroying those facilities in order to affect the war at sea. Today the Army's fleet of preposition ships could aid in the ASW fight by the simple cross decking of Navy ASW helicopters and standard lookout training. If the Army's Sea Basing concept emerges from the conceptual stage, Army aviators will need to have a fundamental understanding of the role they play in the detection of ASW/USW threat. An alternative would be to build an ASW capability into Army ships and perhaps crossdeck Navy ASW helicopters. Special Forces too can be used early in an operation to disrupt an adversary's ability to conduct anti-access missions. Solving this problem will require creative, "out of the box" thinking and experimentation.

Current ASW/USW exercises need to evolve into ones that involve more joint participation. Currently the vast majority of these exercises are conducted exclusively with naval forces. The combatant commanders must drive this effort. It will take considerable effort on the part of the Navy to integrate these "non-traditional" players into the ASW/USW arena as well as to embrace the combined arms capabilities the joint force can bring to bear. The assessment of these exercises will facilitate the identification of seams and complimentary capabilities and help produce truly joint ASW/USW doctrine. This will

become increasingly important as the joint battlespace becomes more and more integrated and tools that enable common operating pictures (COP) give greater situational awareness to the JFC and his component commanders. Raytheon's Integrated Defense System's vision of the future in the joint integrated battlespace is "any sensor, any shooter, any target."³⁷

If ASW is truly such an important warfare skill that the United States can not afford to rely solely on naval forces to counter the threat and assure access and freedom of action for joint forces at sea, then perhaps it's time to create an ASW cell within the combatant commanders staffs. This cell should be a joint cell, that is to say, not staffed solely by naval officers. It should be staffed by members of each service and across platforms (air, surface, subsurface, and special operations). This joint cell should be responsible for the ASW/USW planning effort in general and ensure all options and capabilities are considered and integrated into the plan.

Words are important. Since the Pentagon's "Sea Basing Joint Integrating Concept" describes concerns regarding decreasing access ashore and since Sea Basing provides a method of relief, then perhaps a name change to the concept is in order if it is to be truly joint. War gamers participating in a December 2004 war game developed and conducted by Lockheed Martin commented that the term Sea Basing was seen as too naval a term and therefore not joint enough. "Joint Assured Access Systems" was offered as an alternative to "Sea Basing" to achieve other service support.³⁸ Other services' "buy in" will be critical as the concept moves forward. This "buy in" must include the means to defend the Joint Access System.

Conclusion

“Addressing the threat from diesel-electric attack (SSK) submarines will require a joint effort involving multiple platforms and information sharing”³⁹

Admiral Walter Doran, COMPACFLT

ASW/USW is a core competency of the U.S. Navy and should remain so. Former COMPACFLT, Admiral Thomas Fargo said in June 2000 that ASW is a mission that is distinctly naval and not one to be “outsourced” to the joint community.⁴⁰ Admiral Fargo had it right in the traditional sense of ASW/USW. It was a distinctly naval mission during the Cold War. Admiral Doran’s quote above reflects today’s ASW/USW reality. Decreased ASW/USW asset availability, modern diesel-electric submarine and advanced sea mine proliferation, operational environment shifts from blue to brown water, and decreased access ashore have pushed ASW/USW into the joint arena. Until a technology is developed that makes the littoral seas transparent, ASW/USW will remain a challenging mission area. It is, and will remain, a team sport for the Navy. Increased complexity of the operating environment, an increasingly capable threat, and limited depth on the Navy’s bench require more inter-service cooperation to field an effective team. This will require the Navy to share the “rice bowl” of ASW/USW and recruit new players. The other services have the players the Navy needs to round out the team. The Joint Force Commander (coach) and the component commander (assistant coaches) need this depth on the bench and need to recognize, develop and utilize the unique skill sets the members of the joint team bring to the arena.

Endnotes:

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- ⁶ Ibid
- ⁷ Author's own observations as a member of the Maritime Patrol and Reconnaissance Community
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- ⁹ Benedict, 18
- ¹⁰ Author's own experience as N7 and member of PACFLT ASW "Council of Captains"
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- ³² Roosevelt
- ³³ Hoge, 2

³⁴ Author's own experience as member of P-3C squadron

³⁵ Farrell

³⁶ U.S. Air Force, Countersea Operations Doctrine Document, 36

³⁷ Mike Boots, Raytheon Director of International Business Development and former Air Component Commander, in a presentation to the Naval Command College, 1 SEP 2006.

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³⁹ Admiral Walter Doran, COMPACFLT, quoted in Nick Johnson, "U.S. Navy Must invest in Technology, Training for ASW, Doran Says," *Aerospace Daily* 208, no. 2, 2 October 2003, <http://www.proquest.com/> (accessed 8 September 2006).

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